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PRACTICABILITY AND EFFECTIVITY OF KONCAMA MODEL IN GEOMETRY LEARNING

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Abstract.
KONCAMA Model is a learning model with conceptual conflict in mathematics problem solving. This model is developed to reinfore students' understanding on mathematics concept and make students active in mathematics learning. Learning activities within this KONCAMA model consist of stages as the following: orient students to conflict–based–problem (preconception), organize students to learn and tackle conflict (*reapraisal of cognition*), assist students to investigate and solve problem individually and in group (*cognition development*), develop and display the results of problem solving (*comunication*), along with analyze and evaluate the process of problem solving (*evaluation*). KONCAMA Model is a practical and effective learning model to be implemented in geometry learning of Senior High School students.

Key words: Cognitive conflict, KONCAMA, learning packages, geometry

INTRODUCTION

Competency-based-curriculum recently becomes foundation for developing the quality human resources in educational field. The last issue is that the government of Indonesia in nowadays is starting to implement the Curriculum 2013 as developed from the school-based-curriculum (KTSP) in 2006. In accordance with other competency based curriculums, Curriculum 2013 particularly in mathematics education also recommends to all schooling levels in order to include problem solving as one of core competences. Other recommended competences are reasoning and communication.

In mathematics problem solving, particularly in learning geometry, students can be in difficulty which is caused by the lack of their understanding on the concept of geometry. My observation in 2011 (Asdar, 2011) reveals that geometry learning in a number of grade X students of State Senior High School (SMAN) in Makassar (SMAN 8, SMAN 3, and SMAN 11) that geometry learning is conducted by implementing direct instruction model with lecture/speech method to teach basic concepts of geometry to students in the classroom. The involvement of students in learning occurs when they carry out exercises questions existing in textbook. By the end of geometry instructional meeting, the author collected data using questionnaire about students' responses based on the results of geometry learning that they obtained. The questionnaires reveals that 93,33% students are in difficulty of understanding the concept of geometry that they have learned, 90% students cannot carry out questions concerning geometry that teacher has not exampled, 86,67% students desire to make discussion and brainstorming with their classmate regarding geometry that they have learned, 80% students want to express their understanding on geometry using their own words, and 85,33% students perceive that there is a contrast to their understanding about property, law, or theorem in geometry that they have learned.

Based on the demand of curriculum and the facts showing the lack of students understanding on the concept of geometry and their poor activities in learning, then mathematics learning can be developed through a learning strategy so-called problem solving. One of alternatives of geometry learning strategies that can be used to reinforce SMAN students' understanding on the concept of geometry is cognitive conflict strategy. The cognitive conflict strategy is undertaken by providing information and new knowledge resulting in conflict in students' understanding on concept, and then training them to solve the conflict to reinforce students' conceptual understanding. Theoretically, Piaget (1985) stresses that conceptual undestanding that a child obtain must be through an internal mechanism so-called equilibrium. Therefore, Piaget suggested to provide challenging things to a child or take her/him into a conflict in his/her mind. The conflict is called cognitive conflict.

Some researchers in educational field have used a cognitive conflict as a learning strategy, such as Hewson & Hewson (1984) studying the influence of conceptual conflict in a conceptual change when designing science instruction. Chann & Bereiter (1997) generate student's knowledge by means of conflict mediator in conceptual change. Dreyfuss & Eliovitch (1990) apply conflict cognitive strategy for conceptual alteration. Watson (2002) designs idea or opinion conflict among students in the topic of "sample". Rolka, Rosken & Liljedahl (2007) utilize cognitive conflict as strategy for conflicting students' experiences to new information to change conceptually the students' belief about mathematics and mathematics learning.

Cognitive conflict strategy enables to be implemented in problem based learning. Problem based learning with the cognitive conflict strategy is designed to create an instructional model. Asdar (2012) have studied and developed a valid learning model which is based on problem based learning using cognitive conflict strategy. The learning model is Learning Model with Conceptual Conflict in Mathematics Problem Solving (KONCAMA).

Learning phases with KONCAMA model are as Asdar (2012) have developed as follows: (1) orienting students to conflict based problem (preconception), (2) organizing students to learn and break conflict (reapraisal of cognition), (3) helping students investigate and solve problem individually and in group (cognition development), (4) developing and presenting the result of problem solving (communication), and (5) analyzing and evaluating the process of problem solving (evaluation). Implementing this KONCAMA model will change norm related to learning outcome (knowledge, affective and skill). In addition, this model also enables to provide advantage to students in the lower and upper groups who work together to carry out learning tasks (social system). Learning tasks that are develop based on conflict will maximize the occurance of discussion among students and inter-team as a result of the existance of the distinction of conseption to a given mathematics problem. Reaction principle that is developed emphasizes on the execution of KONCAMA model. The execution is based upon constructivistic theory and cooperative values, interaction and communication providing emphasis on students centered learning through learning in group and individually, meanwhile teacher plays a great role as facilitator, consultant and mediator in student learning. Instructional impacts expected to be attained through implementing KONCAMA model are that students learning outcomes achieve goal/competence as knowledge, affective and skill. Whereas nurturant impacts wanted to be accomplished by implementing this KONCAMA model are characters like cooperative, communicative, critical, respective to opinion and being able to solve problem. Therefore, Asdar (2012) also developed learning packages supporting this KONCAMA model, that is Lesson Plan, Students Book and Students Worksheet.

The main objective of developing this learning model are: (1) examining the practicability and effectivity of learning model with conceptual conflict in mathematics problem solving (KONCAMA model) in geometry learning at State Senior High School, and (2) testing the practicability and effectivity of packages supporting KONCAMA model (Lesson Plan, Student Book and Student Worksheet) in geometry learning at State Senior High School.

METHOD

This research is developmental research. The research design related to the objective of the developmental research above is *developmental design* by Plomp (1997), which consists of 5 (five) stages, namely:

(1) *Pre-studying.* This is the stage for analyzing needs or problem. This stage comprises: (a) identifying information, (b) analyzing information, (c) defining problem, (d) planning subsequent activity.
(2) *Designing.* Activity within this stage aims to design solution to the identified problem in the first stage.
(3) *Realizing/Constructing.* Within this stage, it is created prototype, as the core design of KONCAMA model.
(4) *Testing, Evaluating and Revisiting.* This stage aims at considering quality of the developed design, and making a decision through precise consideration. Evaluation consists of the process of collecting and analyzing information systematically. It is then revised, and then returning to activity design, and so on. This cycle constitutes feed back cycle and stops after obtaining the desired solution.

The quality criteria for KONCAMA model referred to the criteria by Nieveen (1999), that is validity, practicability and effectivity. In the first year of this research, assessment to the results of developing KONCAMA model and its supporting packages satisfies the validity criteria. For examining practicability and effectivity of KONCAMA model and its suporting packages, then it is conducted limited trial in geometry learning of grade X students of State Senior High School 8 Makassar in the topic of three dimensional of the odd semester 2013/2014 for 6 (six) meetings.

KONCAMA Model and its supporting packages in learning are said to be practical, if they satisfy the following criteria: (1) at least four of six experts provide consideration that KONCAMA model is practicable in the classroom, (2) teacher states that he/she is able to implement the model in the classroom, and (3) the level of practicability of KONCAMA model includes in the high category. The utilized criteria for the practicability of the model (KM) referred to as methods of grading in summative evaluation by Bloom, Madaus & Hastings (1981), that is: $90\% \leq KM$ (very high), $80\% \leq KM < 90\%$ (high), $70\% \leq KM < 80\%$ (moderate), $60\% \leq KM < 70\%$ (low), or $KM < 60\%$ (very low).

KONCAMA Model is said to be effective, if it satisfies the following criteria: Kemp, Morrison & Ross (1994), and Egen & Kauchak (1988): (1) the average of students' on-task activity is at least 90%, (2) the average of students' positive activity is at least 40%, (3) the level of conformity of students' activity is observable with the score is at least 80%, (4) there is a trend to the improvement of formative test score. Students in this research are directed to the attainment of the minimum mastery criteria score, that is 70% of students attending test obtain the minimum score 75, (5) more than 50% of students expressing positive responses to KONCAMA model, and (6) teacher providing positive responses to the model.

RESULTS AND DISCUSSION

KONCAMA Learning Model

Prior to conducting KONCAMA learning model, teacher as learning facilitator groups students into team discussion. Each team has 4 (four) members consisting of students sitting nearby each other. Further, mathematics learning is conducted through the following phases.

1. Clarifying goals, motivating and shaping (preconception). Within this stage, teacher goes over the learning goals and motivates students by providing apperception about subject that will be learned. Subsequently, examining students' initial understanding about important aspects related to material that they will learn (preconception). Students reveal their conception based upon real

examples or their initial understanding based on information that they have acquired. In this stage, teacher assigns students to read learning material existing in student book.

2. Orienting students to conflict-based-problem. Teacher provides simple questions conflicting students' preconception. Further, he or she promotes students to follow the subsequent explanation in order that students can find solution to their preconception conflict.
3. Organizing students to learn and break conflict (reapraisal of cognition). Within this stage, teacher accommodate the formation of students conception on basic concepts of geometry, and then direct them to discussion in students learning teams based on their conception differences. At the end of this stage, teacher provides assistance (scaffolding) if students cannot carry out their conflict. During students are in conflict, teacher observes students affective.
4. Assisting students in investigating and solving problem individually and in group (cognition development). In the early part of this stage, teacher directs students to choose one question or problem in student worksheet. The problem is then studied and carried out on the basis of students' well understanding on concept (without conflict). Teacher guides students to solve problems by applying the stages of problem solving well. Subsequently, he or she facilitate the activity of solving all problems in student worksheet that teacher develops for students carry out individually or in group.
5. Developing and presenting the results of problem solving (communication). In this stage, teacher facilitates students/group to present the results of problem solving. When there exists opinion differences (contrast/conflict) among students, teacher then re-provides assistances (scaffolding) until they find sendiri the solution themselves from the contrast.
6. Analyzing and evaluating the process of problem solving (evaluation). In this stage, teacher facilitates discussion about the results of problem solving that students/team do. Teacher directs students' understanding to the principle of problem solving by considering their understandings. They are expected to be able to evaluate the problem solving and reinforce their concept understanding. Students teams that present the solution of the problem solving well and appropriately will obtain reward.
7. Closing. In the last part of KONCAMA learning model, teacher assigns students to make summary about learning material, and make self assessment. Subsequently, prior to closing lesson, teacher provides home work to students and reminding them concerning learning material that will be learn in the subsequent meeting.

The Results of Practicability Analysis of Model KONCAMA

1. General assessment of the practicability of KONCAMA showed that the average of the practicability score was 81.86 (high category).
2. The average of the practicability score for each phase of KONCAMA was 85.67 (high category).
3. The average of the practicability score of social impact resulted in the KONCAMA model was 86 (high category).
4. The average of the practicability score of reaction principle resulted in KONCAMA model was 94 (high category).
5. Teacher implementing KONCAMA in geometry learning of grade X assessed that KONCAMA model could be applied clearly in the classroom.
6. Four experts (validators) had given assessment that KONCAMA model could be executed in the classroom (the results of validity analysis of KONCAMA Model, first year research).

Thus, KONCAMA model developed in this research satisfies "practical" criteria.

The Results of Effectivity Analysis of KONCAMA Model

1. The average of students' on-task activity score was 90.14% (more than 90%)
2. The average of students' positive activity was 58.21% (more than 40%).
3. The level of conformity of students' activity was observable with other students expected was (O-H) as many as 80.29% (more than 80%).
4. 82.25% of students responded positively to KONCAMA model.

5. Teacher tends to responded positively to KONCAMA model.
6. Minimum mastery criteria of the students of State Senior High School 8 Makassar that had attended KONCAMA learning model was achieved, that is 73% of students accomplishing the minimum score 75.

Thus, the results of analysis above shows that the implementation of KONCAMA model is called "effective".

DISCUSSION

High category in the general assessment of the practicability of KONCAMA model indicated that the implementation of KONCAMA model in geometry learning had been executed well. Teacher made time allocation that is used in implementing learning model suitable with the predetermined time allocation in the lesson plan. KONCAMA could be applied easily and effectively to attain learning goals. KONCAMA that is applied by teacher corresponded to school-based-curriculum holding recently where students participated actively, particularly in the activity of revealing their conception and problem solving during the implementation of KONCAMA model took place. The learning model applied was in conformity with the material that students learned.

The accomplishment of high category in the practicability of each phase of KONCAMA model showed that teacher facilitating geometry learning applied the phases of KONCAMA model in well-organized way. Teacher goes over the learning goals and motivated students by providing apperception regarding the learning material that would be learned. He or she assigned students such reading learning material existing in the student book, made a discussion with students and provided guidance. Teacher always provided simple problems conflicting students' preconception. Nevertheless, he or she promoted students in order to be able to find solution to their preconception conflict. He or she facilitated learning, accommodated the formation of conception, and directed students to make discussion in teams during debating of conceptions or carrying out problems in student worksheet. Assistances, guidance (scaffolding) were always be given by the teacher if students were not able to solve their encountered conflict. Teacher guided students to carry out problems in student worksheet through implementing the stages of well problem solving. He or she facilitated students/teams to present the results of problem solving. Providing recognition to groups presenting the solution of their problem solving well and appropriately is always be undertaken by the teacher to motivate students interest in cooperative activity. In the last part of the learning, teacher provides activity to students such making a summary of learning material, making self assessment, providing home work to students and reminding them concerning learning material that they will learn in the subsequent meeting.

Learning with KONCAMA model promoted the appearance of high social impact, the formation of social interaction among students during learning in teams and classically. Students cooperated and discussed each other without paying attention to social status among them, respecting each other and providing the same access for all students without the social position. KONCAMA model effectively enabled students to form groups or teams for discussing each other to solve problem. Students participated actively in group discussion to construct their understanding during the implementation of KONCAMA collectively.

Reaction principle was implemented very well in the learning with this KONCAMA model. In learning, teacher gave more chances to students to work cooperatively without distinguishing individual condition of students. Without looking at social stratification of students, teacher as a facilitator, consultant and mediator in learning, teacher observed students in group work and provided opportunities to students for brainstorming. Within problem solving activity, teacher posed alternative problem solving and ensured that overall students were actively involved during the learning process with KONCAMA Model. The fundamental thing that teacher also applied was in creating reaction

principles in learning by offering chances to students to express their thinking results openly and honest, considering students' understanding (conception).

The practicability of learning with KONCAMA model indicates the ease of teacher in implementing learning, developing social system and reaction principles. This shows that teacher can easily implement the model in learning. He or she is able to apply the model in mathematics learning in other topics.

Mathematics learning in the topic of geometry by implementing KONCAMA model as shown in this research had been implemented effectively. A number of 90,14% students attained the aspect of students' on task activities and 58,21% students were positively active. These indicated that students were enthusiastic to follow teacher's explanation when going over the learning goals and motivating them. The developed students activities were listening, noting, asking question, responding, answering question and discussing the results of problem solving. Students also actively revealed their conception based on real examples or their initial understanding. In the other part, students read learning material existing in the student book, discussed each other and asked for guidance. Students were actively in learning to handle the encountered conflict of the reading results and teacher's explanation to their conception. They also actively attempted to find solution to their preconception conflict. In addition, they were active in learning groups, e.g. explaining their conception, asking question to their friends in their own team, and providing responses. If students in their team could not carry out conflict, they then asked for guidance (scaffolding) to the teacher. They chose one problem that the solution would be presented in the light of students' good concept understanding without conflict. In the activity of solving problem in student worksheet, students carried out problem by implementing the stages of problem solving well either individually or in group. Even in the activity of presenting the results of problem solving, all students wanted to present their problem solving results. Students responded the results of presentation of the representative of group, if there existed conflict among groups. All students provided recognition to groups making good and appropriate problem solving. In the activity of making summary of learning material and making self assessment, students were actively involved. Till the end of learning session, students activeness were still visible, that is when making notes about information of home work and learning material that would be learned in the subsequent meetings. The activities that students showed during learning took place had shown the conformity with the highly expected goals.

Teacher and students had responded positively to the use of KONCAMA model and its supporting packages in mathematics learning. Students and teacher acceptance about learning packagess and other components such as student book, student worksheet, learning situation in the classroom and the teacher's way of teaching and providing guidance were responded as interestingly. Several students responding as lack interesting desired the necessarily to add interesting pictures corresponding to the presented concept in the student book and student worksheet. In general, students considered as easy to understand the material presented in the student book and student worksheet. Those who were in difficulty to understand the content or material of the student book and student worksheet still needed more explanation from the teacher or their friends in their own group. The ease of understanding the content of the student book and student worksheet made the teacher able to provide guidance and assistances (scaffolding) to students and the students could easily understand the teacher's explanation. Students in general also considered that learning packages like the student book and student worksheet were new packages for them. Meanwhile the material that the teacher went over using cognitive conflict approach constituted new things that had not been experienced in the previous mathematics learning or in the other subject. Even the teacher considered the cognitive conflict strategy as a new strategy. The familiar thing for the teacher was the material presented in the student worksheet and that conveyed in the classroom due to for teachers, the geometry problems in this research were familiar things when they taught geometry to the grade X students of State Senior High School. In the aspect of students' achievement progress, students in general perceived that there was an acquired advance particularly in the reinforcement of their understanding on geometry concepts. They also

showed their high interest to the use of cognitive conflict strategy in mathematics learning and wanted teacher to re-implement the strategy in the subsequent mathematics learning, if necessary.

The attainment of minimum mastery criteria as the result of implementing the KONCAMA model in geometry learning of grade X students of State Senior High School 8 Makassar is 73% of students achieving the minimum score 75. This shows that pembelajaran mathematics learning with KONCAMA model has transmitted good enough instructional impact. Students experienced reinforcement to the understanding of the concept of geometry after provided with cognitive conflict strategy in KONCAMA model. The reinforcement encouraged students to creatively be able to solve mathematics problem well. Equilibrium state in understanding concepts of geometry makes students sure about the truth of of their concept understanding and is easily to use in carrying out mathematics problem related to their understanding.

CONCLUSION

The conclusion obtained from this research is that learning model with conceptual conflict in mathematics problem solving (KONCAMA) is a practical and effective learning model. Whereas the learning packagess based on this model, such as lesson plan, student book, and student worksheet are the practical and effective packagess.

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